FUTURE INLETS

Due to increased global temperature, sea level may rise between 1.5 feet to 2.6 feet above modern mean sea level by the year 2100 (Church and White, 2006; Overpeck et al., 2006; IPCC, 2007; Pfeffer et al., 2008; Riggs et al., 2008). In addition, there is growing evidence that warmer global temperatures are already increasing the destructive potential of hurricanes (Emanuel, 2005; Mann and Emanuel, 2006) and may increase the frequency of hurricanes that reach category 4 or 5 (Webster et al., 2005; Elsner et al., 2008). Because barrier islands respond relatively rapidly to changes in sea level and storm activity, global climate change has the potential to significantly alter both the morphology and the evolution of barrier islands in the future, an important component of which is inlet activity. With accelerating climate change and sea-level rise, it has become increasingly important to forecast future barrier island conditions, in order to make long-term coastal management plans and policies. Road maintenance plans, development policies, hazard mitigation, and emergency response plans depend upon an understanding of local erosion rates, and the potential for the creation of new inlets. Some barrier island segments are clearly in danger of developing inlets in the near future. These are the narrow and low barrier island segments that experience the highest erosion rates, such as the island segment immediately north of Rodanthe, or the Buxton and Isabel Inlet areas. In areas with low sand volume (sand-starved segments; Riggs et al., 2008), where the underlying geologic units are not resistant to erosion, major storm surge and cross-island flow can cut a channel substantially below sea level that results in post-storm tidal flow. The result is an inlet.

Several investigations have conducted coastal hazard assessments of the Outer Banks and other coastal areas, including the potential for future inlet formation. These assessments address a range in spatial scales and have different purposes; some are more regional and qualitative in focus while others are detailed and quantitative. For example, Pilkey et al. (1998) produced maps of coastal vulnerability to hurricanes and winter storm damage, including inlet hazard areas, based upon the occurrence of past inlets, island width and elevation, forest cover, dune height and width, erosion or accretion rates, and various human impacts. Riggs et al. (in press) produced maps of inlet vulnerability based on knowledge of the geologic framework, geomorphology and erosion rates (Fig. 19). In a more quantitative assessment and covering a much larger area, Thieler and Hammar-Klose (1999) produced a Coastal Vulnerability Index (CVI) for the U.S. coastline. The CVI is a quantitative measure of the collective risk to coastal hazards and is derived from six parameters including geomorphology, coastal slope, relative sea-level change, shoreline erosion rates, mean tidal range and mean wave height. This index, however, lumps the potential effects of many factors into one measure and, therefore, its relevance to specific hazards

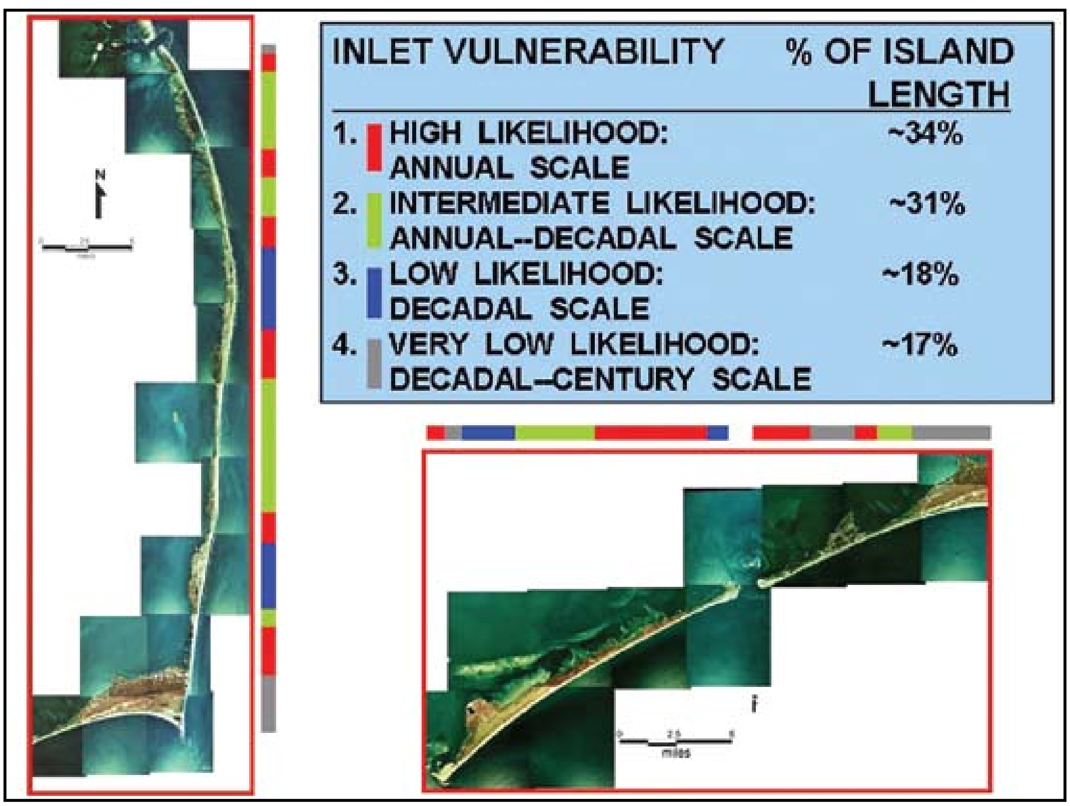

Figure 19. A map from Riggs et al. (in press) showing the potential for future inlet formation based upon barrier island geomorphology.